4WD-RPB

SUBJ: Evaluation of Morton International, Incorporated's status under the RCRIS Corrective Action Environmental Indicator Event Codes (CA725 and CA750)
EPA I.D. Number: MSD 008 186 587

FROM: Russ McLean
Environmental Engineer
South Programs Section

THRU: Wesley Hardegree, Acting Chief
South Programs Section
RCRA Programs Branch

TO: Narindar M. Kumar, Chief
RCRA Programs Branch
Waste Management Division

I. PURPOSE OF MEMO

This memo is written to formalize an evaluation of the Morton International, Inc. (Morton), Moss Point, Mississippi facility's status in relation to the following corrective action event codes defined in the Resource Conservation and Recovery Information System (RCRIS):

1) Current Human Exposures Under Control (CA725),

2) Migration of Contaminated Groundwater Under Control (CA750).

Concurrence by the RCRA Programs Branch Chief is required prior to entering these event codes into RCRIS. Your concurrence with the interpretations provided in the following paragraphs and the subsequent recommendations is satisfied by dating and signing at the appropriate location within Attachments 1 and 2.

II. HISTORY OF ENVIRONMENTAL INDICATOR EVALUATIONS AT THE FACILITY AND REFERENCE DOCUMENTS

This particular evaluation is the first evaluation by the U.S. Environmental Protection Agency (EPA) Region 4, for Morton. The evaluation, and associated interpretations and

conclusions on contamination, exposures and contaminant migration at the facility, is based on

information obtained from the following documents:

1. Morton Response to CERCLA 104 Information Request, August 1998
2. RCRA Part B Permit Application Renewal, July 1998
3. NPDES Compliance Evaluation Report, July 1, 1998
4. Morton Response to Second 3007 Information Request, May 1998
5. Multi-Media Inspection Report, March 27, 1998
6. RCRA Compliance Evaluation Inspection (CEI) Report, December 16, 1997
7. Morton Response to RCRA 3007 Information Request, June 1997
8. Confirmatory Sampling Report, June 19, 1991
9. State of Mississippi Hazardous Waste Permit, August 26, 1988
10. HSWA Permit, February 1990
11. RFA Report, February 1989
12. Hydrogeologic Investigation Report, January 1982

III. FACILITY SUMMARY

Facility History

The Morton facility is located in the town of Moss Point in northeast Jackson County, Mississippi (Figure 1). The facility is bounded on the south by the Escatawpa River and on the west by the Mississippi Export Railroad. Predominantly undeveloped land bounds the facility to the north and east. The facility opened in 1952. Morton owns approximately 431 acres, of which 291 acres are zoned for industrial use. Approximately 120 acres is fenced and the remaining acreage consists of woodlands. The facility manufactures liquid polysulfide, adhesives, sealants, urethanes and monomers in batch, continuous batch and continuous processes. The primary raw materials, which are received in bulk by rail car and tanker truck are ethylene oxide, formaldehyde, sulfur, hydrochloric acid and caustic. The manufacturing area consists of four plants which are identified by the products manufactured, Formal Area [Bis(2-Chloroethoxy) Methane], Urethane Area, Polysulfide Area and Monomer Area.

Waste Management

Waste management consists of a process wastewater treatment system (Ecology Center), a permitted hazardous waste landfill, a hazardous waste container storage unit, a NPDES permitted discharge system for non-contact cooling water and storm water, a sanitary sewer system and two UIC injection wells. Former waste management practices included the usage of unlined ditches which carried untreated wastewater from processing areas to the V-Lagoons and anaerobic pits. Sludges from the V-Lagoons were dredged and disposed in the T-Lagoon landfill system. In 1975, concrete sumps were installed in each process area with associated above-ground piping. Prior to 1987, wastewater generated in each of the process areas was routed to the V-Lagoons where it was neutralized with caustic or acid as appropriate, pumped through a diatomaceous earth filter, pumped through a bank of filter cartridges and finally to a hold tank prior to deepwell injection.

The Ecology Center, constructed in 1987, is designed to treat and dispose of hazardous and non-hazardous industrial process waste, both liquid and solid. The process waste treatment consists of equalization, pH adjustment, solids removal and liquid filtration. The facility generates

an industrial wastewater stream that is high in sodium salts, including sodium chloride, sodium sulfate and other sodium salts containing sulfur and oxygen. This process wastewater is composed of several different waste streams, including acid washes from formal production, NH_3 wash from formal production, alkaline washes from polysulfide manufacturing, washes and reaction wastes from monomer/urethane batch processes, laboratory wastes, F039 multisource leachate from the on-site hazardous waste landfill, Energy Recovery Facility stackwater, process water from the Moss Point Electronic Materials Facility and contaminated storm-water runoff. This wastewater is a characteristic RCRA hazardous waste due to the presence of reactive sulfides (D003). The facility produces about 350,000 gallons per day of process wastewater.

Process water is directed via a series of sumps, concrete sewers and overhead piping to the Ecology Center which provides the facilities for UIC injection of waste liquids and solidification of wastes that formerly went to the landfill but are currently shipped off-site. The UIC wells have operated since 1973 with the construction and operation of UIC No. 1. UIC No. 2 was added in 1976 and UIC No. 3 in 1990. UIC No. 2 was plugged and abandoned in 1990. The facility received approval of its no-migration petition in November 1993. Currently only UIC No. 1 is used for injection. The solids are concentrated in a centrifuge and mixed with cement for solidification in a pug mill and currently shipped offsite for disposal. Process waste sludges, filter media and numerous other materials were formerly disposed in the hazardous waste landfill.

IV. CONCLUSION FOR CA725

It is recommended that the status code IN be entered into RCRIS for CA725, insufficient information available for determining if all human exposures are controlled. Ground water is contaminated in the shallow aquifers beneath the site with volatile and semi-volatile organic constituents above relevant action levels. Although ground-water corrective action systems are operating under the base RCRA program for two regulated land disposal units, potential ground-water impacts from identified SWMUs and AOCs have not been investigated. Additionally, contaminant plume maps indicate contaminated ground water may be migrating off-site. As no investigations of soils, sediments, surface waters and air associated with the SWMUs and AOCs have been implemented, insufficient information has been established to determine that human exposures are controlled (Confirmatory Sampling of soils and sediments in the unlined drainage ditches (SWMU 10) was conducted in accordance with the HSWA permit however, the results of this investigation are inconclusive).

V. CONCLUSION FOR CA750

It is recommended that the status code of NO be entered into the RCRIS for CA750, ground-water releases are not controlled. Ground water is contaminated above relevant action levels and contaminant plume maps indicate that contaminated ground water may be discharging into the Escatawpa River and/or migrating off-site.

VI. SUMMARY OF FOLLOW-UP ACTIONS

A second RFA has been initiated for the facility based on information and events recently disclosed as the result of enforcement actions pursued against the facility. The draft RFA Report is scheduled for submittal in mid-October 1999. The facility is concurrently conducting investigations under a RCRA §3013 Order issued by EPA's RCRA Enforcement and Compliance Branch. The information and findings of these investigations will be incorporated into the HSWA permit scheduled for re-issuance during FY 2000. It is anticipated that RFI/CS activities and any Interim Measures imposed as a result, will allow for a CA725 YE determination in FY 2001. Should it be shown that ground-water contamination is moving off-site through subsequent investigations (i.e.,RFI), a modification of the existing ground-water corrective action system, with additional controls implemented as necessary to prevent further contaminant migration, should be completed by the end of FY2002 with CA750 YE projected in FY2003.

Attachments:
1. CA725: Current Human Exposures Under Control
2. CA750: Migration of Contaminated Groundwater Under Control

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

ATTACHMENT 1
DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA725)
Current Human Exposures Under Control

Facility Name: Morton International, Inc
Facility Address: 5724 Elder Ferry Road, Moss Point, Mississippi
Facility EPA ID #: MSD 008 186 587

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   X If yes - check here and continue with #2 below,

   ____ If no - re-evaluate existing data, or

   ____ If data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			1,1-DCA, 1,2-DCA, 1,1,1-TCA, Bis(2-Chloroethoxy)methane, Bis(2-Chloroethyl)ether , MEK, Toluene
Air (indoors)[2]			X	Shallow ground water contaminated with volatile organics.
Surface Soil (e.g., <2 ft)			X	Evidence of surficial soil contamination during recent VSI (8/99) at several SWMUs.
Surface Water			X	Stormwater ditches collect runoff from SWMUs with suspected surface soil contamination.
Sediment			X	Sediment deposition in stormwater ditches from SWMUs with suspected surface soil contamination.
Subsurface Soil (e.g., >2 ft)			X	At SWMUs with suspected surficial soil contamination.
Air (outdoors)			X	COCs include volatile organics which may be present in surficial soils.

____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

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[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s): Groundwater: Groundwater within the uppermost aquifers underlying the facility is contaminated above relevant action levels with volatile and semi-volatile organic constituents. The facility is conducting corrective action to remediate contaminated ground water under the base RCRA permit. A discussion of the ground-water contamination is presented in the ground-water discussion in Attachment 2.

The facility is constructed on recent fluvial deposits which are 15 to 30 feet in thickness. Underlying this alluvium is the Citronelle Formation which is subdivided into two hydrogeologic units based on differences in grain size (Upper Citronelle and Lower Citronelle). The total thickness of the Citronelle Aquifer system beneath the facility is about 120 feet. Underlying the Citronelle Aquifer system is the Graham Ferry Formation which is hydraulically separated from the uppermost aquifers. The Graham Ferry Aquifer is the most widely used source of drinking water in the Pascagoula area.

The Alluvial Aquifer, an unconfined aquifer, typically consists of fine to medium sand with some silt and thin clay layers. In the area north of the T-Lagoon and active landfill this unit grades into clay. Current ground-water flow is regionally to the south. However, since development of the site, ground water flows in a more radial direction with mounding between the V-Lagoons and the equalization pond (Figure 2). The Alluvial and underlying Upper Citronelle aquifer are separated by a 2 to 20 foot thick gray green clay that contains some silt and sand. It has been established that the Alluvial and Upper Citronelle aquifers are interconnected.

The Upper Citronelle Aquifer consists of 15 to 35 feet of medium sand with some gravel and minor clays. This aquifer is present throughout the plant site except north of the V-Lagoons where it may be thin or absent. Permeability is typically higher than in the Alluvial aquifer and ground-water flow is regionally to the west-northwest. The Upper and Lower Citronelle Aquifers are separated by a green gray clay about 15 thick feet. The Lower Citronelle is about 10 to 20 feet thick with permeability equal to or greater than the Upper Citronelle and ground-water flow generally to the southwest. The base of the Lower Citronelle is a bedded clay formation of regional extent which forms an aquitard between the Citronelle Aquifers and the underlying Graham Ferry Aquifer.

The Graham Ferry Formation underlies the Citronelle Aquifer system and is approximately 70 feet in thickness. This formation is composed of deltaic sediments which uncomformably underlie the Lower Citronelle Aquifer. Approximately 60% of all groundwater used in the area comes from the Graham Ferry Formation at a depth of 170 to 250 feet .

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media	**Residents**	**Workers**	**Day-Care**	**Construction**	**Trespassers**	**Recreation**	**Food[3]**
Groundwater	No	No	N/L	N/L	No	No	N/L
Air (indoors)	N/L	?	N/L	N/L	No	No	No
Soil (surface, e.g., <2 ft)	N/L	?	No	?	No	N/L	N/L
Surface Water	No	?	No	?	No	No	N/L
Sediment	No	?	No	?	No	No	N/L
Soil (subsurface, e.g., >2 ft)	No	N/L	No	No	No	No	N/L
Air (outdoors)	N/L	?	No	?	No	No	N/L

Instructions for Summary Exposure Pathway Evaluation Table:

1. For Media which are not "contaminated" as identified in #2, please strike-out specific Media, including Human Receptors' spaces, or enter "N/C" for not contaminated.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations, some potential "Contaminated" Media - Human Receptor combinations (Pathways) are not assigned spaces in the above table (i.e, **N/L - not likely**). While these combinations may not be probable in most situations, they may be possible in some settings and **should be added as necessary**.

____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

____ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

__X__ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

Rationale and Reference(s): To determine a complete pathway, the following information is needed:

1) contamination (output from Question 2),
2) an exposure point where contact can occur and,
3) an exposure route where contact can occur

Any point of potential contact with a contaminated medium is an exposure point (e.g., a drinking water well, an area of soil contamination which is present at the surface, accessible surface water). A probable exposure route (e.g., ingestion, inhalation, dermal contact) should be based on the media contaminated and the anticipated activities at the exposure points.

In this case, there is insufficient information on whether or not contamination exists. Therefore, determination of a complete pathway present at the site is undeterminable at this time. However, it can be stated that there are no residents or day-care pathways present at this site. In addition, trespassers are unlikely given that the entire active area of the facility is fenced and 24-hour surveillance is provided by a security personnel.

The following is a brief explanation of known contamination in each medium, potential human exposures and the further investigations planned.

Ground water: One municipal well, a few industrial wells and many domestic wells produce water from the Citronelle and terrace deposits in Jackson County. However, no water supply wells are known to be producing from the alluvial deposits within a two-mile radius of the facility. On-site groundwater wells constructed in the Alluvial and Citronelle Aquifers are used only for ground-water quality monitoring and recovery purposes. The facility also has on-site wells constructed in the Graham Ferry Aquifer, to supply process water.

Surface water: Due to reported "general pollution and saltwater intrusion", the Escatawpa River has no known intakes for potable water below 17 miles upstream of the facility. Therefore there is no potential drinking water exposure to contaminants from this surface water source (Reference 2). The Escatawpa River is located approximately .3 miles south of the facility. The portion of the river near the Morton facility is subject to saltwater intrusion that can make the water unsuitable for most industrial uses. This portion of the river has a fish and wildlife classification and has no recreational designation. The MDEQ has issued a recreational usage advisory for the river in this area due to bacterial contamination. It has been determined that this contamination is from agricultural activities upstream of the facility. The on-site stormwater drainage ditches receive runoff from SWMU areas which may be contaminated. Investigation of the ditches and surface soils will be conducted under the re-issued HSWA permit.

Soils and Sediments: In June 1991 (Reference 8), the facility submitted a Confirmatory Sampling Report for soils in a former drainage ditch in accordance with the HSWA permit issued in February 1990. Soil samples were collected and analyzed using the TCLP. Detectable levels of several hazardous constituents were reported. The results of this sampling effort are inconclusive in determining the impact soils in this ditch system could have on potential human receptors. One additional SWMU and one AOC were identified in the HSWA permit for Confirmatory Sampling however, because of pending enforcement actions being pursued at the facility, the work plan submitted for these areas was never approved. A second RFA has been initiated at the facility utilizing new information disclosed as the result of these enforcement actions. The review of this information and the VSI conducted in August 1999 has identified areas at the facility requiring investigations for potential releases of hazardous constituents to soils and surface waters. Further investigations will be required for on-site soils and sediments.

Air: Because some of the hazardous constituents present in ground water and possible surface soils are volatiles, the air pathway is a potential concern. Insufficient information is available to determine if the air pathway poses a threat to human receptors.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and
Reference(s):_____
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[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and
Reference(s):_____

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS Event Code (CA725)

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

____ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the _____ _____ facility, EPA ID #_____, located at _____ under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

__X__ IN - More information is needed to make a determination.

Completed by: _____ Date: _____
Russ McLean
Environmental Engineer
EPA Region 4

Supervisor: _____ Date:_____
Wesley Hardegree
Acting Chief, South Programs Section
EPA Region 4

Branch Chief: _____ Date: _____
Narindar M. Kumar
Chief, RCRA Programs Branch
EPA Region 4

Locations where References may be found:

EPA Region 4 RCRA File Room
10th Floor, 61Forsyth Street SW
Atlanta, Georgia 30303

Contact telephone and e-mail number:

Russ McLean (404) 562-8504

ATTACHMENT 2
DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS Event Code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: Morton International, Inc.
Facility Address: 5724 Elder Ferry Road, Moss Point, Mississippi
Facility EPA ID #: MSD 008 186 587

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   X If yes - check here and continue with #2 below,

   ____ If no - re-evaluate existing data, or

   ____ If data are not available, skip to #8 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[5] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): The facility has instituted corrective action programs under the base RCRA permit issued by MDEQ (Reference 9) to address ground-water contamination in the Alluvial and Upper Citronelle Aquifers. Contaminated ground water associated with the closed T-Lagoon is currently being recovered by four (4) wells screened in the Alluvial Aquifer.

Contaminated ground water associated with the V-Lagoons is being recovered by three (3) wells screened in the Alluvial Aquifer and one (1) well screened in the Upper Citronelle. The most recent Semi-Annual Ground-Water Monitoring Report indicates the following concentrations of constituents of concern in the Alluvial Aquifer: Carbon Disulfide-8,050 µg/l, 1,1-Dichloroethane-610 µg/l, 1,1-Dichloroethene-37.2 µg/l, 1,2-Dichloroethane-11,600 µg/l, 1,1,1-Trichloroethane-218 µg/l, Bis(2-Chloroethyl)Ether-705 µg/l, Bis(2-Chloroethoxy)Methane-17,800 µg/l, Toluene-600 µg/l and MEK-1200 µg/l. Constituents of concern detected in the Upper Citronelle Aquifer include: 1,1-Dichloroethane-34.1 µg/l, 1,2-Dichloroethane-2,020 µg/l, Bis(2-Chloroethyl)Ether-76.6 µg/l and Bis(2-Chloroethoxy)Methane-27,600 µg/l. Constituents detected in the Lower Citronelle Aquifer include: 1,1 Dichloroethane-0.4 µg/l, 1,2-Dichloroethane-94.7 µg/l, Bis(2-Chloroethyl)Ether-15.2 µg/l and Bis(2Chloroethoxy)Methane-397 µg/l. MCLs have been established for the constituents; 1,2-Dichloroethane-5 µg/l, 1,1-Dichloroethene-7 µg/l, 1,1,1-Trichloroethane-200 µg/l and Toluene-1,000 µg/l. Risk based concentrations for tap water, as found in the EPA, Region 3 Tables, for the remaining constituents are: Carbon Disulfide-1,000 µg/l, 1,1-Dichloroethane-800 µg/l, Bis(2-Chloroethyl)Ether-.0096 µg/l and MEK-1,900 µg/l. There is no risk based concentration established for Bis(2-Chloroethoxy)Methane. The facility has proposed an ACL for this constituent of 350 µg/l based on toxicity data from a study conducted on rats by Bio/Dynamics, Inc. (1989). This information is found in Appendix E of the RCRA Part B Renewal Application dated July 1998 (Reference 2).

Ground water is monitored by a total of 48 monitoring wells and 12 piezometers with 28 monitoring wells and the 12 piezometers screened in the Alluvial Aquifer, 15 monitoring wells screened in the Upper Citronelle Aquifer and five (5) monitoring wells screened in the Lower Citronelle Aquifer (Reference 2).

[5] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[6] as defined by the monitoring locations designated at the time of this determination?

____ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[6]).

__X__ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[6]) - skip to #8 and enter "NO" status code, after providing an explanation.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): Ground-water contamination currently exists in the Alluvial, Upper Citronelle and Lower Citronelle Aquifers. This contamination is found in the areas of the V-Lagoons, the T-Lagoon and the closed landfill. Contaminant plume maps generated for 1,1-Dichloroethane, 1,2-Dichloroethane, Bis(2-Chloroethyl)Ether and Bis(2-Chlorethoxy)Methane in the Alluvial Aquifer do not establish a plume boundary in the downgradiant direction toward the Escatawpa River. This suggests the potential for migration of constituents into the river. The plume map for Bis(2-Chloroethoxy)Methane in the Alluvial Aquifer (Figure3) indicates that the highest concentration of this constituent is found in MW-36 which, according to the potentiometric map in Figure 2, defines the southern edge of the ground-water mound. Ground-water flow from this point is southward toward the river (Refernce2).

Ground-water flow in the Upper Citronelle Aquifer is to the west-northwest. The plume map for 1,2-Dichloroethane in the Upper Citronelle indicates constituent concentrations of 2,030 µg/l in MW-23, 161 µg/l in VUCP-1 and 5.19 µg/l in MW-41. These wells define the downgradiant limit of the current monitoring system in this aquifer. This situation also exists for the constituents 1,1-Dichloroethane, Bis(2-Chloroethoxy)Methane and Bis(2-Chloroethyl)Ether in the Upper Citronelle Aquifer (Reference 2).
Furthermore, analysis of the current potentiometric maps indicates that the capture zones of the groundwater recovery well systems are not capturing the known groundwater contamination.

Contamination in the Lower Citronelle appears to be fairly well defined in the area of the V-Lagoons, although only four wells monitor the aquifer in this area. Only one well monitors this aquifer in the area of the T-Lagoon, where 1,2-Dichloroethane was detected at a concentration of 2.18 µg/l.

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6 "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

____ If yes - continue after identifying potentially affected surface water bodies.

____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale and
Reference(s):_____

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[8] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature and number of discharging contaminants, or environmental setting) which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[8] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) providing a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[8] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[7] greater than 100 times their appropriate groundwater "levels," providing the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identifying if there is evidence that the amount of discharging contaminants is increasing.

____ If unknown - enter "IN" status code in #8.

Rationale and
Reference(s):_____

[7] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[8])?

____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR
2) providing or referencing an interim-assessment,[9] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

____ If unknown - skip to 8 and enter "IN" status code.

Rationale and
Reference(s):_____
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[8] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[9] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

    ____ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

    ____ If no - enter "NO" status code in #8.

    ____ If unknown - enter "IN" status code in #8.

    Rationale and
    Reference(s):_____
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RCRA Corrective Action
Environmental Indicator (EI) RCRIS Event Code (CA750)

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

____ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the _____ _____facility , EPA ID # _____ , located at_____. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

__X__ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by: _____ Date _____
Russ McLean
South Programs Section
EPA Region 4

Supervisor _____ Date_____
Wesley Hardegree
Acting Chief, South Programs Section
EPA Region 4

Branch Chief:_____ Date: _____
Narindar M. Kumar
Chief, RCRA Programs Branch
EPA Region 4

Location where References may be found:

EPA Region 4 RCRA File Room
10th Floor, 61Forsyth Street SW
Atlanta, Georgia 30303

Contact telephone number:

Russ McLean (404) 562-8504